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Shifts in Supply Areas and Consumption Rates for Vegetables, 1939 to 1955

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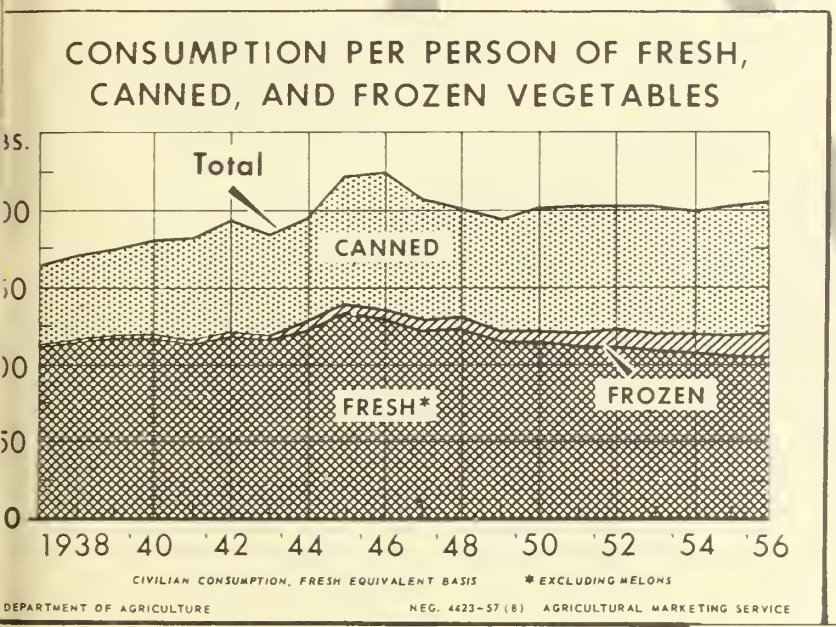
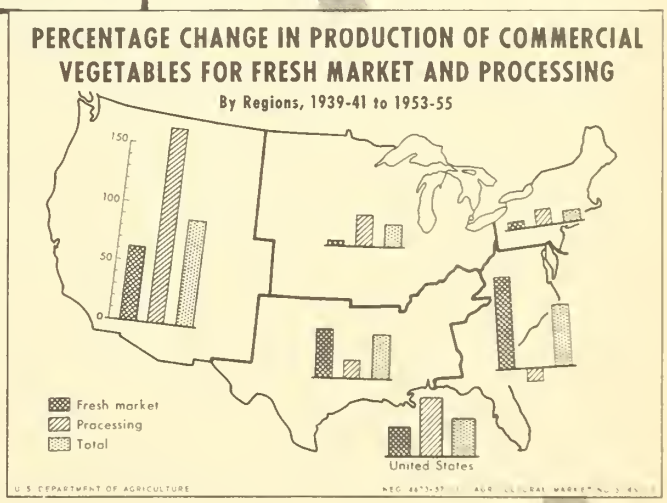

CONSUMPTION PER PERSON OF FRESH, CANNED, AND FROZEN VEGETABLES
Total
CANNED
FROZEN
FRESH*
1938 '40 '42 '44 '46 '48 '50 '52 '54 '56
CIVILIAN CONSUMPTION, FRESH EQUIVALENT BASIS
* EXCLUDING MELONS
DEPARTMENT OF AGRICULTURE
NEG. 4423-57 (8) AGRICULTURAL MARKETING SERVICE



Agricultural Marketing Service

Marketing Research Division

Marketing Research Report No. 221

UNITED STATES DEPARTMENT OF AGRICULTURE

This report deals with certain changes in the supply of vegetables, in the location of major sources of supply, and in the amounts of fresh and processed vegetables consumed between the years immediately preceding World War II and the early 1950's. It is part of a broad program of research aimed at more efficient production and marketing of foods.

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March 1958

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HIGHLIGHTS

Changes in supply areas and consumption rates for vegetables have marked impacts on marketing agencies as well as on producers and consumers. This report brings together available data on these shifts between the period 1939-41, the immediate prewar years, and 1953-55, the most recent period for which data are available.

The most dynamic factor on the consumption side of the market during this period was the severalfold increase in consumption of frozen vegetables. Consumption per person of fresh vegetables increased only slightly, while that of frozen and canned vegetables rose more rapidly. Frozen vegetables accounted for 7 percent of the market (fresh weight equivalent) in 1953-55, as compared with 1 percent in 1939-41. Consumption of canned vegetables increased from 34 to 40 percent during the same period, while that of fresh vegetables declined from 65 to 53 percent. The biggest part of the increase in the consumption of canned vegetables was in canned tomato products, such as catsup, sauce, puree, and juice, and in pickles.

Consumption rates of 22 vegetables were analyzed. Per capita consumption of 8 of these vegetables, in all forms, increased considerably. Consumption per person of 7 others changed less than 10 percent, while consumption of the remaining 7 declined 10 percent or more.

The frozen product replaced a portion of the fresh market for brussels sprouts, cauliflower, lima beans, snap beans, peas, asparagus, and spinach. Consumption per person of all forms of corn, broccoli, kale, and carrots increased.

Total production of commercial vegetables increased 32 percent between 1939-41 and 1953-55. Production for processing rose 50 percent, while production for fresh marketing increased 25 percent.

There was a pronounced shift to the West in the location of vegetable production between these two periods, chiefly to California, which is an important supplier both of the fresh market and of processors, especially freezers. The West increased its share of total production from 26 to 37 percent.

Total production in Florida more than doubled, and in Wisconsin nearly doubled, between 1939-41 and 1953-55. Florida produces chiefly for the fresh market, while Wisconsin produces mainly for canners.

Case studies of 14 individual vegetables point up significant changes in supply areas and consumption rates for each.

SHIFTS IN SUPPLY AREAS AND CONSUMPTION RATES FOR VEGETABLES, 1939 TO 1955

By Alden C. Manchester and Joseph C. Podany, agricultural economists
Market Organization and Costs Branch
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Producers, processors, distributors, and consumers of agricultural products need a great deal of information on changes in the markets which they serve or which serve them. The Department of Agriculture publishes a vast array of statistical information on many aspects of the production, marketing, and consumption of foods. It is not difficult to become so engrossed in an inspection of the individual statistical trees that one loses sight of the forest. Occasionally, it is well to step back and take a look at the overall situation to point up the major shifts that have taken place. Such a look--from one point of view--is offered in this publication.

A knowledge of the supply and consumption situations is essential to an understanding of the changing marketing institutions in the vegetable industry. Supply, consumption, and markets interact constantly in our dynamic economy. The introduction of a technological change such as quick-freezing started a chain of events in the vegetable industry which affected almost every part of it. New supply areas increased their share of national production, while others stood still or declined. New marketing channels, embodying new firms with different buying, selling, and handling practices, took a share of the market from established firms handling fresh and canned vegetables.

When consumers increase their demand for one product, or for one form of a product (e.g., frozen) at the expense of the others, the market structure is influenced: the demand for services of some firms increases while for others it decreases. Such a change in consumer demand also affects the demand for the products of different supply areas, affecting not only the growers in those areas, but also marketing firms located at shipping points, and transportation agencies.

Continued integration of marketing firms which process and sell vegetables not only affects other firms in the industry in the obvious ways, but also affects different supply areas in different ways. A large processor or chainstore may require larger supplies of a given product than local producers can furnish. Nearby "market garden" areas may find themselves at a disadvantage as compared with distant specialized production areas.

In this overall inspection of the supply and consumption situation for vegetables, we have not attempted to develop any new data, but rather to point up some of the major changes between the years immediately preceding World War

II and the early 1950's. Therefore, we have considered averages for 3-year periods, 1939-41 and 1953-55, instead of year-to-year fluctuations in production and consumption. This report deals chiefly with changes between the averages of these 2 periods. Discussion in terms of these 2 periods neglects the path taken from 1 point in time to another, in some cases ignoring wartime or immediate postwar highs or lows, which are more extreme than the values at either the beginning or the end of the period. Many of these situations were caused by wartime measures or postwar stringencies which are not relevant to the peacetime situations with which we are concerned.

The American diet underwent some substantial changes between 1939-41 and 1953-55. Striking increases in incomes available to consumers made it possible for many families to shift their food selections toward those which they preferred and could now (more nearly) afford to purchase. Per capita consumption of all food increased 6 percent, as measured by the Agricultural Marketing Service price-weighted index of food consumption, but pounds of food consumed actually declined 4 percent between 1939-41 and 1953-55. 1/ This disparity between measures calculated on different bases reflects the shift to higher-priced foods.

Consumption per person of protein foods--eggs, dairy products (except butter), meat, fish, and poultry--and of sugar and syrups increased more than consumption of all food (fig. 1). Per capita consumption of vegetables increased somewhat less than the average for all food. Fruit, cereals, beans, peas, nuts, fats and oils, potatoes and sweetpotatoes, and beverages (coffee, tea, and cocoa) gave ground to more favored foods.

SHIFTS IN CONSUMPTION

In any one year, consumption of a given vegetable is largely predetermined by plantings and weather conditions, except for cases of "economic abandonment" where the price to the grower falls so low that he does not consider it worth his while to harvest all or part of his crop. Thus, the price received by farmers for a vegetable is determined by the interaction of a virtually fixed supply with the demand schedule for that product. Farmers' expectations of price, which largely determine their plantings in a given year, apparently are influenced more by the price in the preceding year than by any other single factor. Thus, if prices for any one vegetable are relatively low for several years because of a downward shift in the demand curve, caused by changes in tastes or income, production and hence consumption of that crop will tend to decline.

It is in the light of this type of supply-demand-price structure that this analysis of changes in consumption rates of individual vegetables over a 14-year period, using 3-year averages at each end of the period, can be usefully described in terms of factors affecting consumption. A similar analysis

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1/ Agriculture Handbook No. 62, "Consumption of Food in the United States," Supplement for 1956. See complete reference, p. 29.

of year-to-year changes would not be appropriate, because of the complications on the supply side.

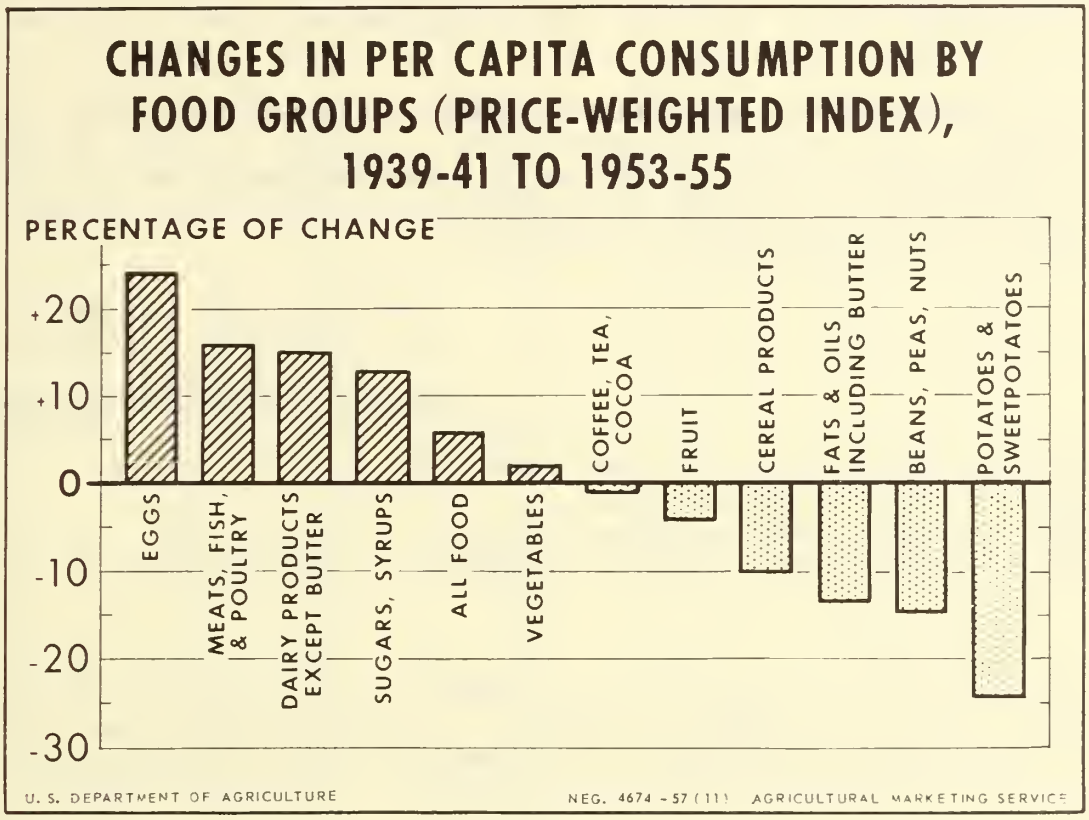

Figure 1.

Consumption per person of all vegetables (excluding potatoes, sweetpotatoes, and melons) in terms of pounds fresh-equivalent increased 12 percent between 1939-41 and 1953-55. Processed vegetables took an increasing share of the market. Per capita consumption rates for fresh vegetables declined 8 percent, while those for canned and frozen vegetables rose 29 and 864 percent, respectively. Despite the rapid rate of growth for frozen vegetables, they accounted for only 7 percent of total consumption (fresh-equivalent) in the postwar period. Fresh vegetables were still the most important form, despite a decline in their share of the market.

	Percentage of total consumption (Fresh-equivalent basis)	
	1939-41	1953-55
Fresh	65	53
Canned	34	40
Frozen	1	7

Most of the increase in consumption of canned vegetables occurred in pickles and in tomato products such as catsup, chili sauce, paste, puree, and juice. The total consumption of other canned vegetables--those which are usually put on the dinner plate as vegetables rather than as condiments, beverages, or ingredients of some other dish--increased only slightly between 1939-41 and 1953-55.

Some vegetables are consumed almost entirely in fresh form, while others are consumed in both fresh and processed forms. In spite of widely divergent trends in consumption rates for fresh and processed vegetables and for individual products within each group, the shifts in consumption have been remarkably similar for various groups of commodities.

	Change in total consumption (in all forms), 1939-41 to 1953-55 (Percent--fresh-equivalent basis)
7 vegetables consumed largely in fresh form	+14
4 vegetables consumed fresh and canned	+11
4 vegetables consumed fresh and frozen	+ 6
7 vegetables consumed fresh, canned, and frozen	+14
All vegetables	+12

Among vegetables consumed chiefly in fresh form, consumption rates of 3 (artichokes, onions, and eggplant) declined, of 2 others (peppers and celery) remained relatively constant, and of the remaining 2 for which figures are available (garlic and lettuce), increased from 35 to 45 percent (table 1).

Cabbage, cucumbers, tomatoes, and beets are sold in both fresh and canned forms. Of the first three, the canned product is substantially different from the fresh. Cabbage and sauerkraut, cucumbers and pickles, and tomatoes and catsup, chili sauce, tomato paste, and puree appear to be so unlike that there is relatively little competition between them at the retail level. Per capita consumption of cabbage, both fresh and as sauerkraut, has declined since the prewar period. Consumption of fresh tomatoes has declined 5 percent, while that of processed tomatoes has increased 40 percent.

The only vegetable in this group whose fresh and canned forms appear to be directly competitive is beets. Total consumption has not changed since 1939-41, but canned beets have largely replaced fresh.

In 1939-41, consumption of these 4 vegetables as a group was divided evenly between fresh and canned. By 1953-55, the canned form accounted for 63 percent of the total.

Four vegetables--cauliflower, brussels sprouts, kale, and broccoli--are consumed in fresh and frozen forms. In the prewar period, only 1 percent of the total consumption was of the frozen form. This share had risen to 32

Table 1.--Changes in per capita consumption of vegetables, 1939-41 to 1953-55

Vegetable	Farm weight, 1939-41				Farm weight, 1953-55				Change, 1939-41 to 1953-55			
	All forms	Fresh	Canned	Frozen	All forms	Fresh	Canned	Frozen	All forms	Fresh	Canned	Frozen
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Percent	Percent	Percent	Percent
Consumed fresh only:												
Lettuce	13.1	13.1	--	--	19.0	19.0	--	--	+45	+45	--	--
Garlic	.2	.2	--	--	.2	.2	--	--	+35	+35	--	--
Peppers	1.9	1.9	--	--	2.0	2.0	--	--	+5	+5	--	--
Celery	8.4	8.4	--	--	8.6	8.6	--	--	+2	+2	--	--
Onions	11.7	11.7	--	--	10.4	10.4	--	--	-11	-11	--	--
Artichokes	.2	.2	--	--	.2	.2	--	--	-13	-13	--	--
Eggplant	.5	.5	--	--	.4	.4	--	--	-15	-15	--	--
Total	36.0	36.0	--	--	40.9	40.9	--	--	+14	+14	--	--
Consumed fresh and canned:												
Cucumbers	4.6	2.3	1/2.3	--	6.6	2.7	1/3.9	--	+44	+17	1/+71	--
Tomatoes	42.0	13.5	2/28.5	--	52.8	12.8	2/40.0	--	+26	-5	2/+40	--
Beets	2.6	1.7	.9	--	2.5	.8	1.7	--	-5	-50	+75	--
Cabbage	19.8	17.0	2.8	--	14.7	12.2	2.5	--	-26	-29	-9	--
Total	69.0	34.5	34.5	--	76.6	28.6	48.0	--	+11	-17	+39	--
Consumed fresh and frozen:												
Broccoli	.7	.7	--	*	1.2	.6	--	0.6	+72	-14	--	+3,100
Brussels sprouts	.3	.3	--	*	.3	.1	--	.2	+14	-63	--	+2,100
Kale	.3	.3	--	*	.3	.2	--	.1	+4	-15	--	+00
Cauliflower	3.1	3.1	--	*	2.8	2.3	--	.6	-10	-27	--	+2,750
Total	4.4	4.4	--	0.1	4.7	3.2	--	1.5	+6	-27	--	+2,860
Consumed fresh, canned, and frozen:												
Lima beans	1.8	.8	.7	.3	2.6	.4	.7	1.6	+48	-55	+1	+500
Corn	17.2	5.6	11.4	.2	23.4	8.2	13.3	1.9	+36	+46	+16	+972
Carrots	7.9	7.6	.3	*	8.5	7.5	.5	.5	+7	-1	+45	+2,200
Snap beans	6.6	4.9	1.6	.1	6.9	3.4	2.8	.8	+5	-30	+66	+1,217
Peas	12.2	2.2	9.3	.7	12.5	.4	8.2	3.9	+2	-81	-12	+451
Asparagus	2.3	1.4	.8	.1	2.0	.7	1.0	.3	-13	-49	+21	+256
Spinach	3.6	2.7	.9	*	3.0	1.2	.8	1.0	-19	-57	-7	+2,233
Total	51.6	25.2	25.1	1.3	58.9	21.8	27.2	9.9	+14	-14	+8	+638
All others	17.4	15.6	1.7	*	18.6	12.1	4.1	2.4	+7	-22	+130	+5,050
All vegetables	178.4	115.7	61.3	1.4	199.7	106.6	79.3	13.8	+12	-8	+29	+864

1/ Pickles.
2/ All canned tomato products: Whole, paste, puree, sauce, ketchup, chili sauce, juice, etc.
* Less than 0.05 pounds.

percent by 1953-55. Consumption of the fresh form of all 4 declined during the period, although that of fresh broccoli and kale did so at a much more moderate rate. All 4 showed tremendous percentage increases in frozen consumption, because of the low level from which they started. However, the increase in sales of frozen cauliflower was not quite large enough to replace the losses in sales of fresh cauliflower. Total consumption of broccoli showed a sharp increase, while that of kale and brussels sprouts showed a modest increase.

Seven of the vegetables studied are sold in all 3 forms. Of these, spinach and asparagus showed a decline in total consumption, with all of the decrease coming in sales of the fresh form. The total consumption of peas was almost the same in both periods, but a major shift from fresh to frozen peas had occurred. The other 4--snap beans, carrots, sweet corn, and lima beans--showed increases in total consumption ranging from 5 to 48 percent. Consumption of all forms of corn increased. Consumption of fresh snap beans declined, while that of canned and frozen snap beans increased. Consumption of lima beans shifted sharply from the fresh to the frozen form, with little change in the sale of the canned form.

For this group as a whole, sales of fresh forms declined 14 percent, of canned forms increased 8 percent, and of frozen forms increased 638 percent. Consumption of fresh forms declined from 49 to 37 percent of the total, and that of frozen forms increased from 2 to 17 percent of the total.

INDICATORS OF HOUSEHOLD AND INSTITUTIONAL CONSUMPTION

There are no figures, official or otherwise, indicating the division of vegetable consumption between households and public and private eating places--restaurants, hotels, lunch counters, boarding houses, college and industrial cafeterias, hospitals, and other institutions. Yet the marketing problems of selling to households are quite different from those involved in selling to the many types of what are loosely called "institutional" users.

It has been estimated that, in 1939, 16.6 percent of the retail value of food marketed by farmers was consumed in eating places other than households. The estimate for 1948 was 17.9 percent. 2/ Away-from-home eating increased rapidly during World War II with increased mobility of the population, rising incomes, rationing, and increased employment in war industries.

By 1953-55, the proportion of food eaten outside the home had declined somewhat from the 1948 level. Sales of food by retail stores increased 31 percent between 1948 and 1953-55, while those by public eating places were rising 24 percent. 3/ Using the basic estimates for 1939 and 1948 and applying

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2/ Marguerite C. Burk. "Distribution of the Food Supply of the United States." U. S. Bur. Agr. Econ., Agr. Econ. Res., pp. 83-87. July 1952.

3/ Business Statistics, 1957. U. S. Dept. Commerce, p. 46, 1957.

appropriate rates of change, we estimate that the proportion of all food consumed in public and private eating places was virtually unchanged between 1939-41 and 1953-55. While sales by public eating places have risen somewhat more rapidly than sales by retail food stores between the two periods, the value of food furnished to employees by public eating places has increased much less, so that consumption in all public and private eating places since 1939-41 appears to have increased at a slightly lower rate than retail sales for off-premise consumption.

The only measure we have--albeit an imperfect one--of the relative use of vegetables in households and in eating places is for canned and frozen products. Figures on production by major container size give some indication of the change in use of vegetables. For the canned product, the proportion of the total pack in No. 10 cans furnishes a clue to consumption in households and elsewhere. Of course, not all eating places purchase canned vegetables in No. 10 cans. A survey of restaurants made for the Can Manufacturers Institute showed that a little less than two-thirds of all canned foods were bought in No. 10 cans. 4/ It appears likely that, if figures for vegetables only were available, the proportion would be somewhat higher, since purchases of fruits and especially juices in No. 10 cans probably occur less frequently than do those of vegetables.

For 10 major vegetables, the proportion of the pack put up in No. 10 cans increased from 12 percent in 1939-41 to 18 percent in 1953-55 (fig. 2). The share of the pack in large, institutional-size containers increased for each of the 10 vegetables except sauerkraut.

Frozen vegetables are packed in retail containers of 1 pound or less, in institutional containers from $2\frac{1}{2}$ to 10 pounds, and in bulk containers usually holding 30 or 50 pounds. The bulk pack is used chiefly by manufacturers of other food products such as frozen potpies, soups, prepared dinners, etc. Data on container size of frozen foods are available only since 1944. In that year, 44 percent of the pack was in retail-size containers, 37 percent in $2\frac{1}{2}$- to 10-pound institutional sizes, and 19 percent in the large "manufacturing" sizes. However, 19 percent of the pack was purchased by the military, probably more in institutional than in other sizes. In 1954, 64 percent of the pack was in retail-size containers, 19 percent in institutional sizes, and 17 percent in the large containers. Only 7 percent of the total was purchased by the military and for overseas relief and similar shipments (figs. 3 and 4).

The shares of the frozen vegetable market taken by containers of different sizes have been reasonably stable since about 1948. Up to that point, the pack in retail-size containers was increasing much more rapidly than that in the larger containers. These figures appear to indicate that frozen vegetables were accepted more promptly by buyers of institutional-size packages than by buyers of retail-size packages, and that acceptance by household consumers was increasing between the end of World War II and about 1948. Since that time,

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4/ Harold H. Jaeger. "Restaurants--A Billion-Dollar Canned Food Market." Speech to Nat. Canners Assoc., Feb. 19, 1955.

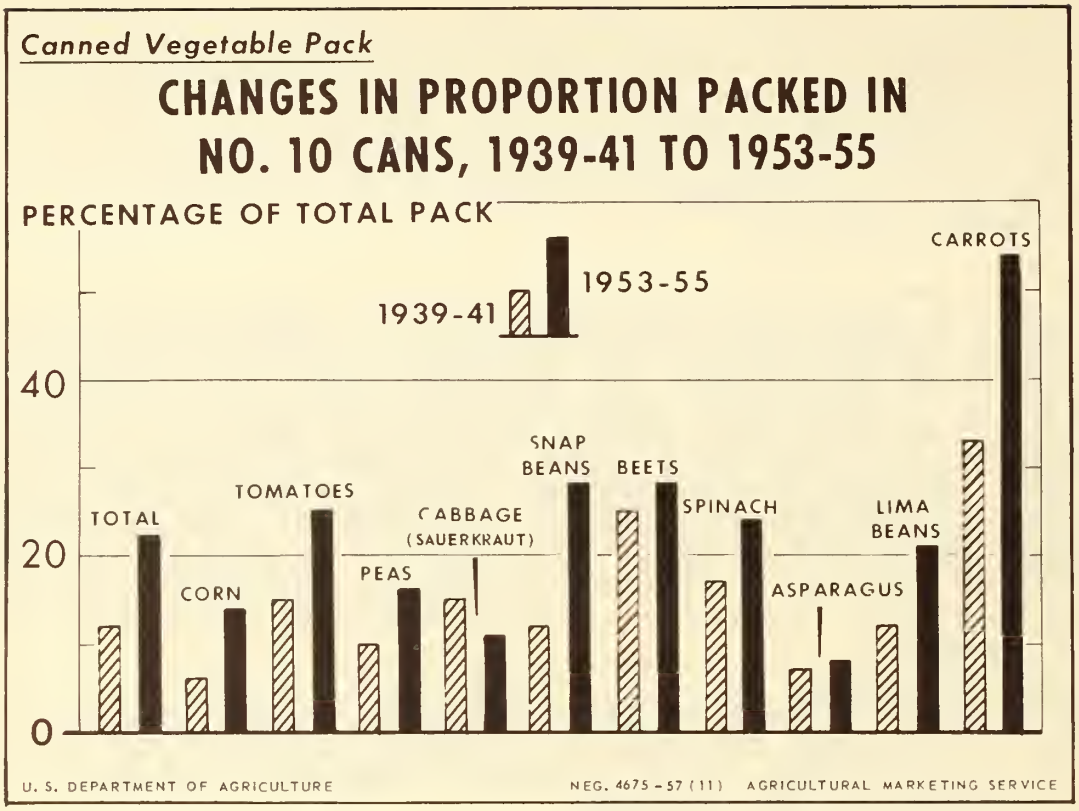


Figure 2.

the share of the pack in retail-size containers has been fairly constant, between 64 and 68 percent of the total. Of course, many restaurants and other public and private eating places buy frozen vegetables in the retail-size packages, for reasons such as portion control, small-lot cooking, etc. Perhaps some of the change represents an increase in such buying by eating places.

SHIFTS IN SUPPLY AREAS

The total commercial production of vegetables, both for fresh market and for processing, as reported by the Crop Reporting Board of the United States Department of Agriculture, increased one-third between 1939-41 and 1953-55. The greatest increases occurred in production for processing, which rose one-half between these two periods. Production for fresh market increased one-fourth. 5/

5/ The production figures in this section are all from official reports of the Crop Reporting Board of the U. S. Department of Agriculture. Between 1939-41 and 1953-55, the Board's coverage of specific fresh market vegetables in commercial States increased from 75 to 87 percent of the estimated total production of vegetables for fresh market. This change is reflected in the statistics discussed here, as well as actual changes in production in the different areas. The figures for total production used here are those for production of major and minor vegetables in both commercial and noncommercial States.

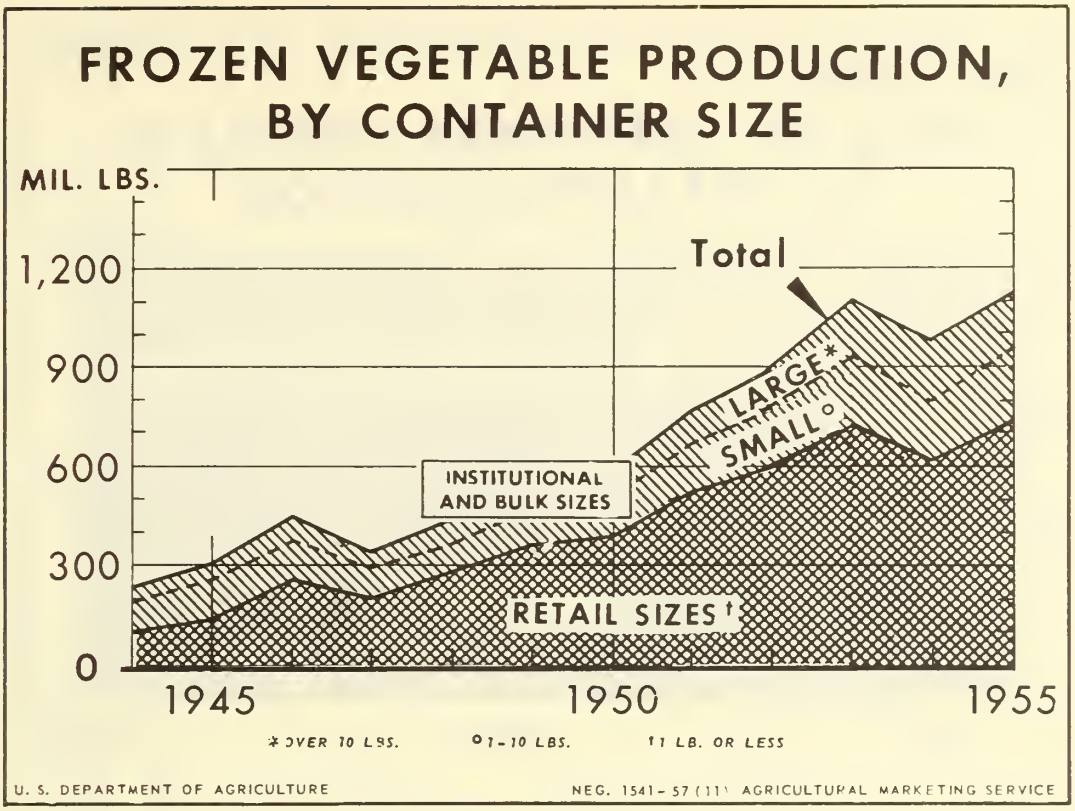


Figure 3.

There was a pronounced shift to the West in the location of vegetable production between 1939-41 and 1953-55. The West increased its production by 90 percent, raising its share of national production from 26 to 37 percent (cover chart and table 2). The only other region which increased total production faster than the United States average was the South Atlantic, which increased its share of national production from 14 to 16 percent. The South Central region increased production slightly more than the country as a whole, but not enough to increase its share of total output. The North Atlantic and North Central regions increased production at a slower rate, and thus each lost 1 to 2 percent of the national output. Some of the changes may have been due to coverage of more crops by the Crop Reporting Board, but this was a minor factor. (For regions see map, p. 30.)

Production of vegetables for fresh market showed a pattern similar to that for all production. The West increased its share of the national output from 28 to 36 percent, and the South Atlantic region increased its share from 14 to 20 percent.

Production for processing nearly doubled in the West, raising that area's share from 22 to 39 percent of the total. It also increased in all other regions except the South Central, but at a slower rate. Much of the increase

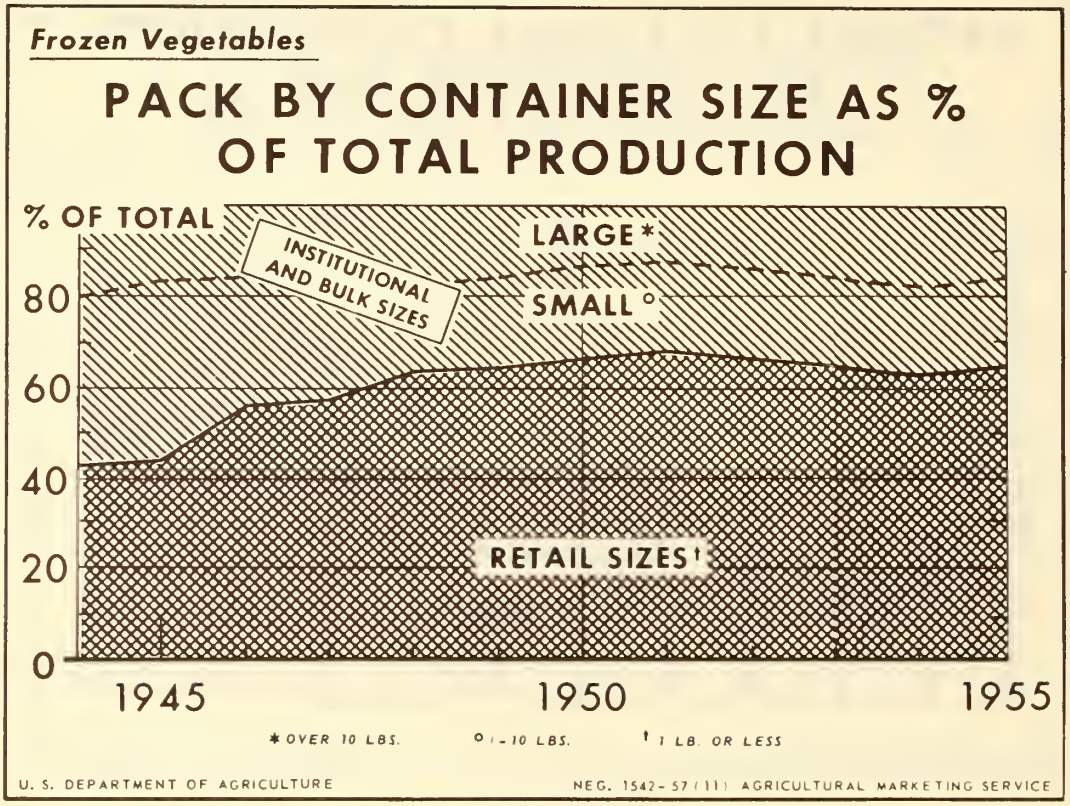


Figure 4.

in the West has been due to the growth in demand for vegetables for freezing. In 1953, for example, 60 percent of the frozen vegetables was packed in the Pacific Coast and Mountain States. The Midwest, which is a major canning section, produced only 6 percent of the frozen pack. Production for processing declined in both the South Atlantic and South Central regions.

The biggest increases in production occurred in the specialized States. Total production nearly doubled in three States: California, Florida, and Wisconsin. Production in Florida is mostly for fresh market, in Wisconsin mainly for canning. California is the largest supplier of both the fresh and processing markets, with the greatest increase coming in production for processing. The great expansion came in production for freezing. California and Florida together supply over a third of the fresh-market vegetables produced, and California and Wisconsin combined produce nearly 40 percent of the vegetables for processing.

The increases in production in Florida, California, and Texas have meant a significant change in the seasonal pattern of production of vegetables for fresh market. Winter and spring production is larger now than it was in 1939-41 (table 3). Production expanded during all seasons, but the growth in fall and summer production was at substantially slower rates.

Table 2.--Production of commercial vegetables, including melons, for fresh market and processing, by regions and by selected States, 1939-41 and 1953-55

Item	Fresh market			Processing			Total		
	Percentage of U.S. production		Change, 1939-41 to 1953-55 1/	Percentage of U.S. production		Change, 1939-41 to 1953-55 1/	Percentage of U.S. production		Change, 1939-41 to 1953-55 1/
	1939-41	1953-55		1939-41	1953-55		1939-41	1953-55	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Major crops in commercial States	75	87	+45	100	100	+50	82	92	+47
Principal commercial States in:									
Northeast	13	12	+7	20	15	+14	15	13	+10
Midwest	9	8	+4	41	35	+27	19	17	+19
South Atlantic	14	2-	+78	14	8	-12	14	16	+52
South Central	10	12	+41	4	3	+15	9	9	+37
West	28	36	+63	22	39	+165	26	37	+90
Major crops in non-commercial States	14	4	-45	0	0	0	10	21	-45
Minor crops	11	9	-27	0	0	0	8	6	-27
United States	100	100	+25	100	100	+50	100	100	+32
Major crops in selected States:									
California	19	26	+76	16	29	+178	18	27	+103
Florida	6	12	+162	2/	1	+677	4	9	+171
Texas	6	9	+68	1	2	+98	5	6	+70
New York	8	6	-6	9	7	+14	8	6	+2
New Jersey	3	3	+5	6	4	+9	4	3	+7
Indiana	1	1	-12	12	5	-35	5	2	-31
Wisconsin	1	1	+32	7	10	+117	3	4	+98
Minnesota	1	1	-12	5	6	+67	2	2	+48

1/ Includes change in number of crops reported.
2/ Less than 0.5 percent.

Table 3.--Production of vegetables for fresh market in principal producing States, including melons, United States, by seasons, 1939-41 to 1953-55

Season	Percentage of U. S. total		Percentage of change
	1939-41	1953-55	1939-41 to 1953-55
Winter	12	15	+76
Spring	21	24	+68
Summer	47	43	+36
Fall	20	18	+25

CASE STUDIES OF INDIVIDUAL VEGETABLES

We now shift our attention from changes in production and consumption of all vegetables to changes in specific commodities. It is, after all, the changes in production and consumption of individual vegetables which, added together, make up the totals. While the conditions that affect one crop are often important for several others, there are other influences which are specific to one vegetable.

Seven vegetables showed increases in per capita consumption of more than 25 percent between 1939-41 and 1953-55. Three of these--lettuce, garlic, and cucumbers--are consumed almost entirely in fresh form. (Cucumbers are, of course, made into pickles, but in that state they are a vegetable in a botanical, not in a culinary, sense.) Corn, which showed the largest percentage increase in fresh consumption, is consumed in fresh, canned, and frozen forms.

Lettuce

Per capita consumption of lettuce increased 45 percent between the two periods. Total production rose 95 percent. Over three-fourths of the total was produced on irrigated land in California and Arizona, with 63 percent of the national production in California. The chief production areas in these two States are the Salinas-Watsonville district on the central California coast, the Imperial Valley section in southern California and the nearby Yuma district in Arizona, the Salt River district around Phoenix, Ariz., and the Santa Maria district along the California coast north of Los Angeles. The increase in production in California and Arizona has set the pace for the national totals, which changed in approximately the same proportions.

The fastest rate of increase in lettuce production has been in Texas. Production in the lower Rio Grande Valley, which was almost none before the war, increased so that Texas was the third ranking State in 1953-55, although its production still represented only 6 percent of the United States total. New Jersey production more than doubled between the 2 periods.

The increase in production is accounted for about equally by increases in acreage and by rising yields.

Changes in the overall pattern of lettuce production, both geographic and seasonal, have been relatively minor.

Sweet corn

Sweet corn is the only vegetable consumed fresh, canned, and frozen for which per capita consumption in fresh form increased between 1939-41 and 1953-55. Consumption of sweet corn in all forms has, in fact, shown increases over the prewar period. Consumption of fresh sweet corn increased 46 percent; of canned, 16 percent; and of frozen, over 900 percent, between the two periods (fig. 5).

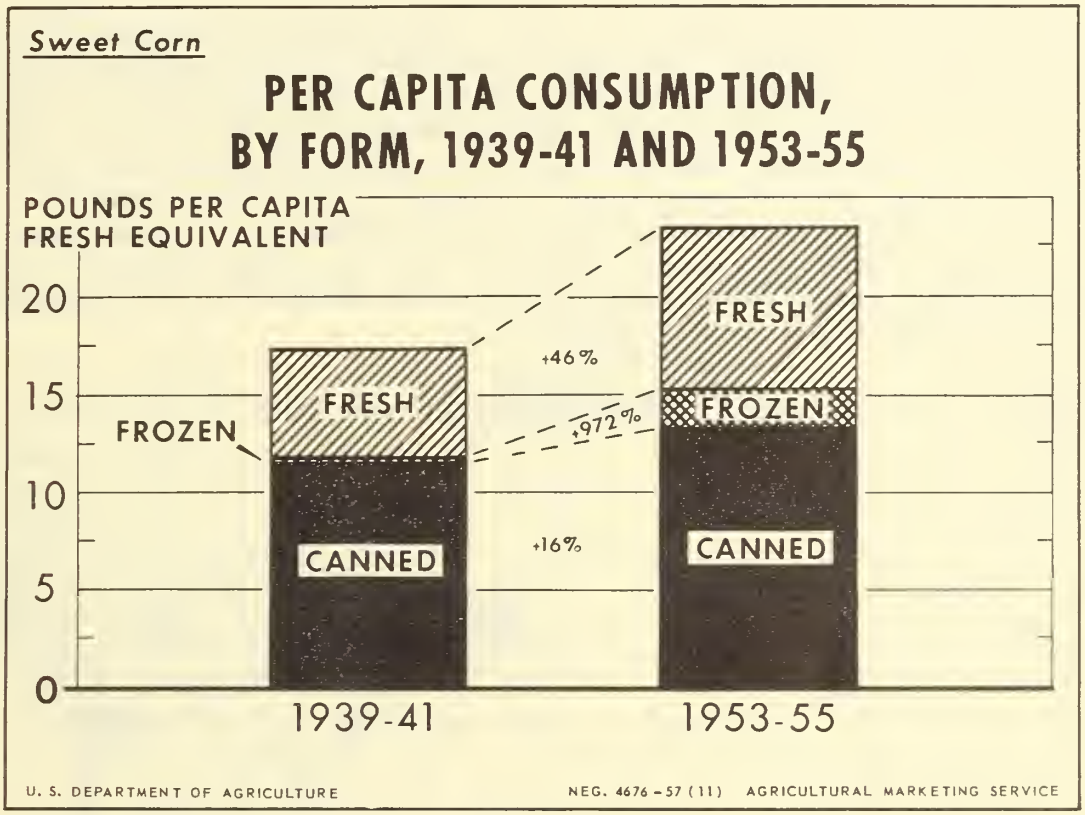


Figure 5.

The proportion of canned sweet corn consumed declined from 66 to 57 percent of the total; consumption of fresh sweet corn increased its share from 33 to 35 percent, and that of frozen sweet corn rose from 1 to 8 percent of the total.

Fresh sweet corn is now available the year around. Production in Florida during the winter months, when fresh sweet corn is not produced in areas to the north, has increased severalfold since the prewar period. The effects of

this change to year-round availability can be seen in markets like Boston and Chicago. In 1940, fresh sweet corn was available in quantity only from June through October, with almost all of it received during the local marketing season of July, August, and September. By 1953, sweet corn was available on the Boston and Chicago markets the year around. Total receipts were 40 percent greater than in 1940. Nearly one-fourth was received during the cold-weather months from November through May, almost all of this from Florida with small amounts from California. A small portion of the indicated increase in receipts may be due to more complete reporting of truck receipts.

Total production of sweet corn in the United States increased by about two-thirds between 1939-41 and 1953-55, with the increase distributed nearly evenly between production for fresh market and production for processing.

Over two-thirds of all sweet corn grown commercially in the United States is destined for the processor. The major producers of sweet corn for processing have been and continue to be Minnesota, Illinois, and Wisconsin. Production in all of these States increased sharply between 1939-41 and 1953-55, with that in Wisconsin more than doubling, bringing it up from the third rank in volume of production for processing in 1939-41 to the second rank in 1953-55, almost equal to Minnesota. Of the other Midwestern States, Iowa showed a slight increase in production for processing, while Ohio and Indiana showed a decline. Fresh-market production in Ohio apparently increased somewhat over the same period, however (fig. 6).

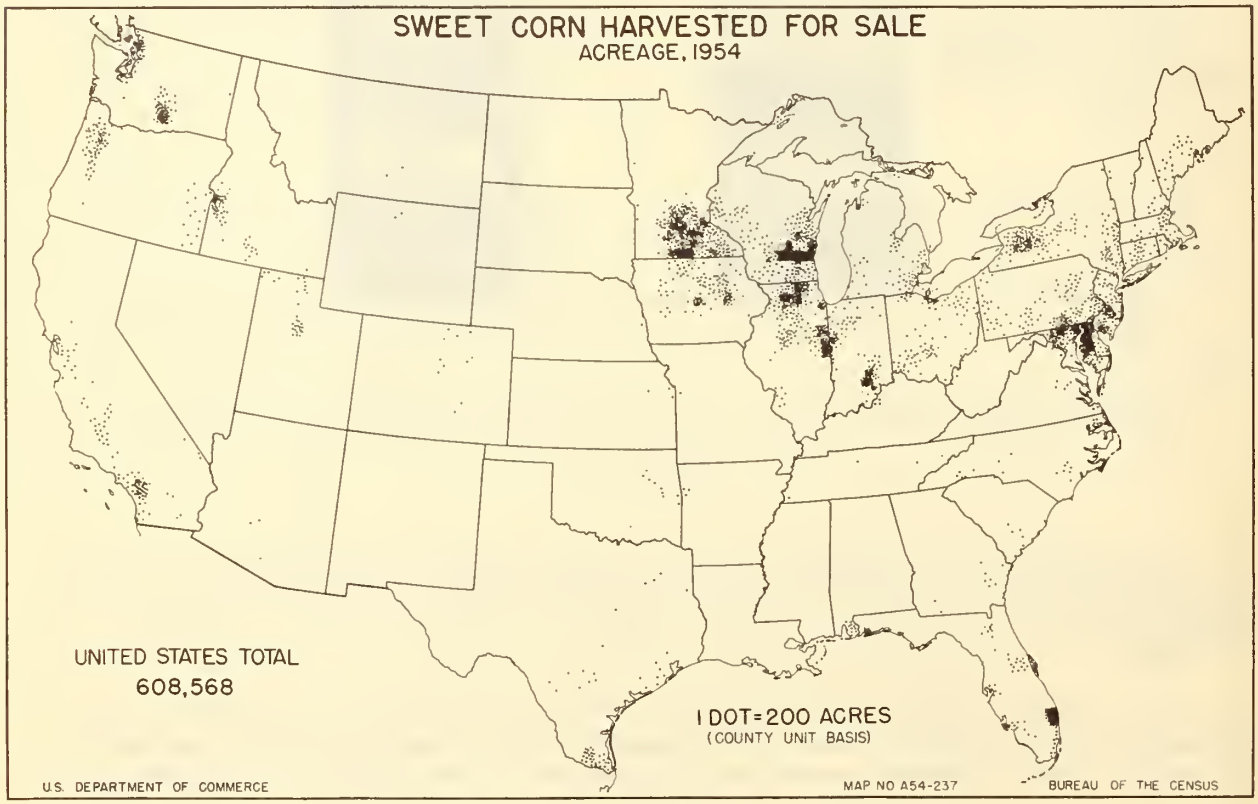


Figure 6.

In the Northeast, Maryland and New York produce corn for both fresh market and processing. Total production in both States increased. In Pennsylvania, production for processing increased 11 percent, and for fresh market, 18 percent; production for processing accounted for 60 percent of the total in 1953-55. Fresh-market States showed varied patterns, with New Jersey declining 13 percent and most of the New England States increasing somewhat.

Production in winter and spring fresh-market States, such as Florida, California, and Texas, increased sharply over prewar levels. Each of the four States in the Northwest and Mountain area--Washington, Oregon, Idaho, and Utah--where production is primarily for processing showed a manyfold increase in production.

Sweet corn production for processing increased in all areas of the country, with the sharpest increases occurring in the Northwest and Mountain States, the principal producers of sweet corn for freezing (table 4). The Midwest still accounts for two-thirds of the sweet corn for processing, however. In 1953, 72 percent of the United States pack of canned corn was put up in the Midwest.

Table 4.--Sweet corn grown for processing, by major production areas, 1939-41 and 1953-55

Item	Percentage of U. S. production		Percentage change, 1939-41 to 1953-55
	1939-41	1953-55	
Principal States in:			
Midwest	71	67	+56
Northeast	13	8	+ 4
Northwest and Mountain	4	16	+584
Delaware, Maryland, and Virginia	9	6	+11
United States	3	3	+34

Fresh-market production, which in the Northeast has risen moderately since 1939-41, doubled in the rest of the country. Much of the increase occurred in the winter and spring areas--Florida, California, and Texas--which accounted for 30 percent of fresh-market production in 1953-55.

Tomatoes

Tomatoes are sold in a greater variety of forms than any other vegetable. In 1953-55, fresh tomatoes accounted for about 25 percent of sales; canned wholes and pieces, juice, and catsup and chili sauce, from 13 to 16 percent each; and pulp, puree, paste, and sauce, nearly 30 percent. Substantial

quantities also go into tomato soup, but figures are not available on the precise quantity. None of these products is competitive at the consumer end, except perhaps fresh and canned whole tomatoes to a limited extent.

Consumption per person of tomatoes in all forms has risen 26 percent since 1939-41, but the changes have been different between forms. Consumption of fresh tomatoes declined slightly, while consumption of canned whole tomatoes declined nearly one-fourth. Juice consumption has risen 68 percent; catsup and chili sauce, 18 percent; and pulp, puree, and sauce, 159 percent since 1939-41 (fig. 7).

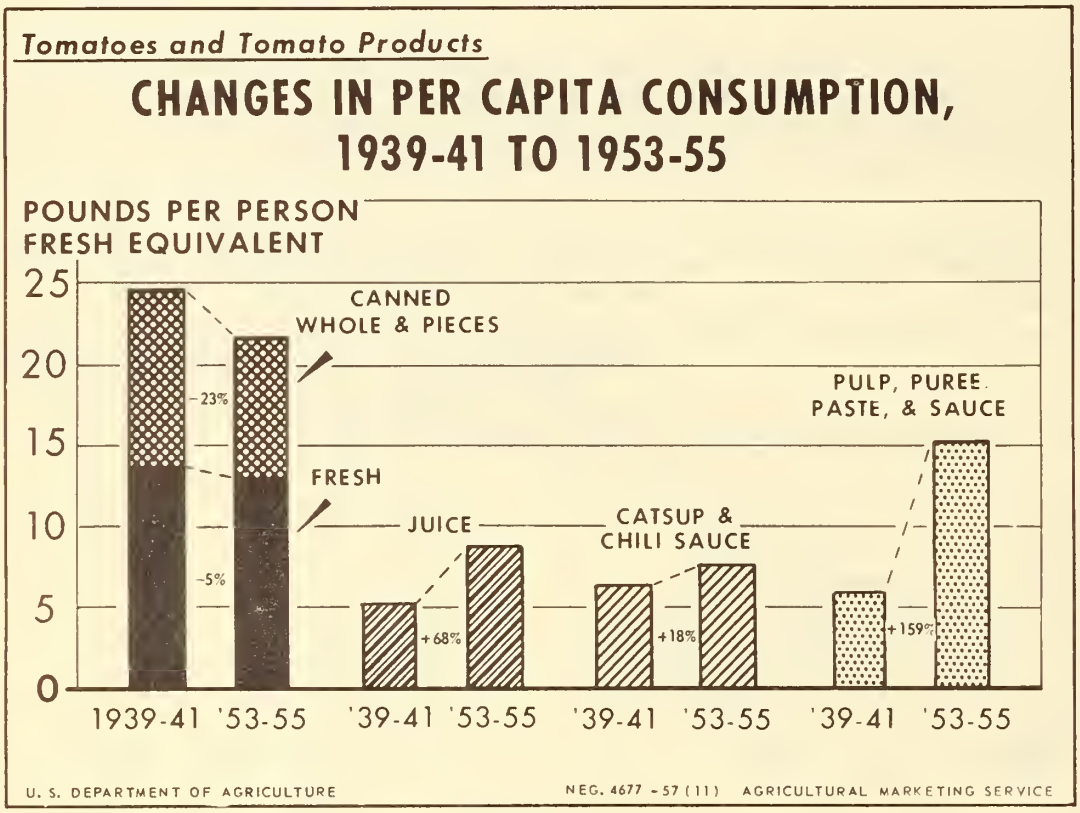


Figure 7.

Canned whole tomatoes have apparently been partly replaced in the diet by other vegetables, and in cooking by pulp, puree, and sauce. Tomato juice apparently has shared in the increasing market for juices which provide vitamin C, along with orange juice.

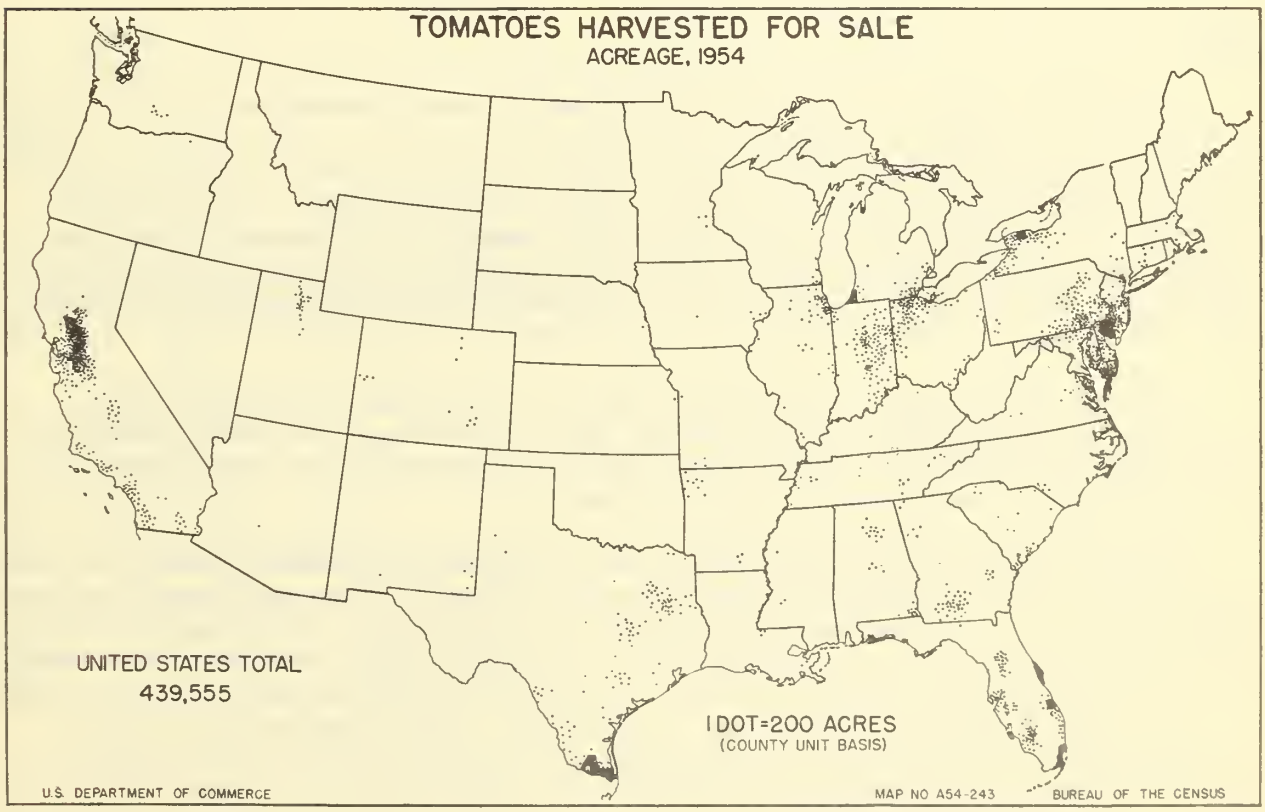
There has been a substantial shift in production areas for tomatoes, chiefly to California, Texas, and Florida (table 5 and fig. 8). The greatest changes in area have taken place in production for processing, which has increased about twice as much as production for fresh market.

Table 5.--Shifts in production areas for tomatoes, fresh market and processing, 1939-41 to 1953-55

Item	Percentage of United States production						Percentage of change, 1939-41 to 1953-55		
	Total		Fresh market		Processing		Total	Fresh market	Processing
	1939-41	1953-55	1939-41	1953-55	1939-41	1953-55			
Principal States in:									
Northeast	19	13	14	10	21	13	-7	-15	-5
Midwest	25	26	10	9	32	31	+46	+2	+51
South	25	17	40	48	20	8	-3	+40	-36
West	25	43	20	28	27	47	+146	+65	+168
Other States	5	1	16	5	1	1/	-64	-13	-69
United States	100	100	100	100	100	100	+43	+17	+38
California	21	40	16	26	23	44	+170	+91	+190
Texas	4	3	11	9	1	1	+13	-7	+84
Florida	3	7	12	27	1/	1	+134	+158	+595

1/ Less than 0.5 percent.

Figure 8.



Changes in the Midwest and Northeast have been relatively minor, although there were some fairly sizable shifts between States within each of the 2 areas. Production in the Midsouth (Missouri, Arkansas, Tennessee), which was never of major importance, declined to 1 percent of national output.

Production in California has tripled since 1939-41, now accounting for 40 percent of national output. The increase is due almost entirely to larger yields per acre. California's per-acre yield of canning tomatoes is now nearly 3 times the yield for the rest of the country. It has been nearly 50 percent larger than in any other State in most recent years.

California and Florida together account for most of the increase in national production for fresh market from 1939-41 to 1953-55. The volume of fresh-market production in the Northeast decreased 15 percent, and in the Midwest it remained virtually unchanged from 1939-41; thus the combined fresh-market output of the 2 regions dropped from 24 to 19 percent. Fresh-market production declined in the Midsouth, in Texas, and in all minor States as a group.

The change in seasonal availability which so influenced the production and consumption patterns for sweet corn took place many years before 1939 for tomatoes. Tomato production was well established in the winter and spring areas in 1939.

Peas

Peas have long been the best seller among frozen vegetables. They provide an example of success in taking over the market from the fresh product. Frozen peas have even taken over part of the market for canned peas. In 1939-41, 18 percent of the peas consumed was fresh, 76 percent was canned, and 6 percent was frozen. By 1953-55, the proportions had changed to 3 percent fresh, 66 percent canned, and 31 percent frozen. With total consumption virtually unchanged, frozen peas had taken over 14 percent of the total market from fresh peas and 10 percent of the market from canned peas (fig. 9).

An increasing share of the frozen peas is going into prepared dishes, such as potpies and frozen dinners. By 1955, according to a trade estimate, approximately 10 percent of the total pack was being used in such items. A further increase can probably be expected.

Public and private eating places use very few fresh peas, because of the large amounts of hand labor required to shell them. Frozen peas were thus an early favorite of commercial and institutional kitchens. In 1944, 63 percent of the frozen peas was in the large, institutional packs. Use of frozen peas in 1-pound and smaller sizes, chiefly in households, increased faster than use of the larger packages between the two periods--largely because the eating places had made an earlier start--so that 57 percent of the frozen peas was packed in retail-size units in 1953-55.

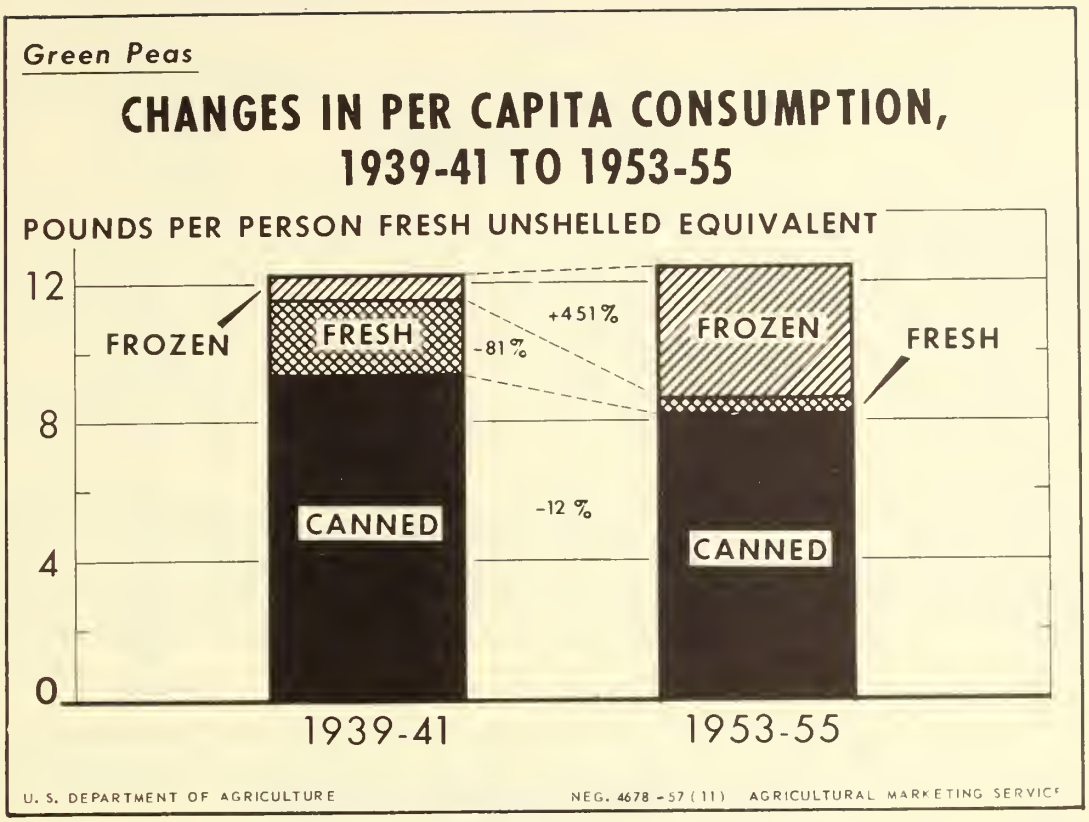


Figure 9.

The shift in consumption from fresh to frozen form is, of course, reflected in the production figures. Of the States that were producing chiefly for the fresh market during the prewar period, some, such as California and Colorado, have shown sharp decreases in production; others, such as Idaho and New York, have shifted to production for processing.

Eight of the 19 principal States have shown declines in production for processing. Three of these were in the Midwest (Ohio, Michigan, and Indiana), 2 in the Mountain area (Utah and Colorado), and 2 in the Northeast (New York and Pennsylvania). However, increases in the 3 most important Midwestern States that produce peas for processing (Wisconsin, Minnesota, and Illinois) have more than offset the declines in the more easterly States of the region, and the Midwest has maintained its share (about one-half) of the production for processing (table 6 and fig. 10). There has been an increasing concentration of the remainder of the production for processing in the specialist States, particularly in the Northwest.

Production of peas for freezing is largely concentrated in the West, while canning is centered in the Midwest. In 1953, for example, 72 percent of the frozen pea pack was put up in the West, 21 percent in the East and South

Table 6.--Shifts in production areas for peas for processing, 1939-41 to 1953-55

Item	Percentage of United States production		Percentage of change, 1939-41 to 1953-55
	1939-41	1953-55	
19 principal States in:			
Northeast	15	9	-5
Midwest	52	51	+54
South	5	4	+23
West	26	34	+105
Other States	2	2	+19
United States	100	100	+56
Individual States:			
Wisconsin	30	29	+49
Washington	10	16	+160
Oregon	9	10	+85
Minnesota	8	12	+116

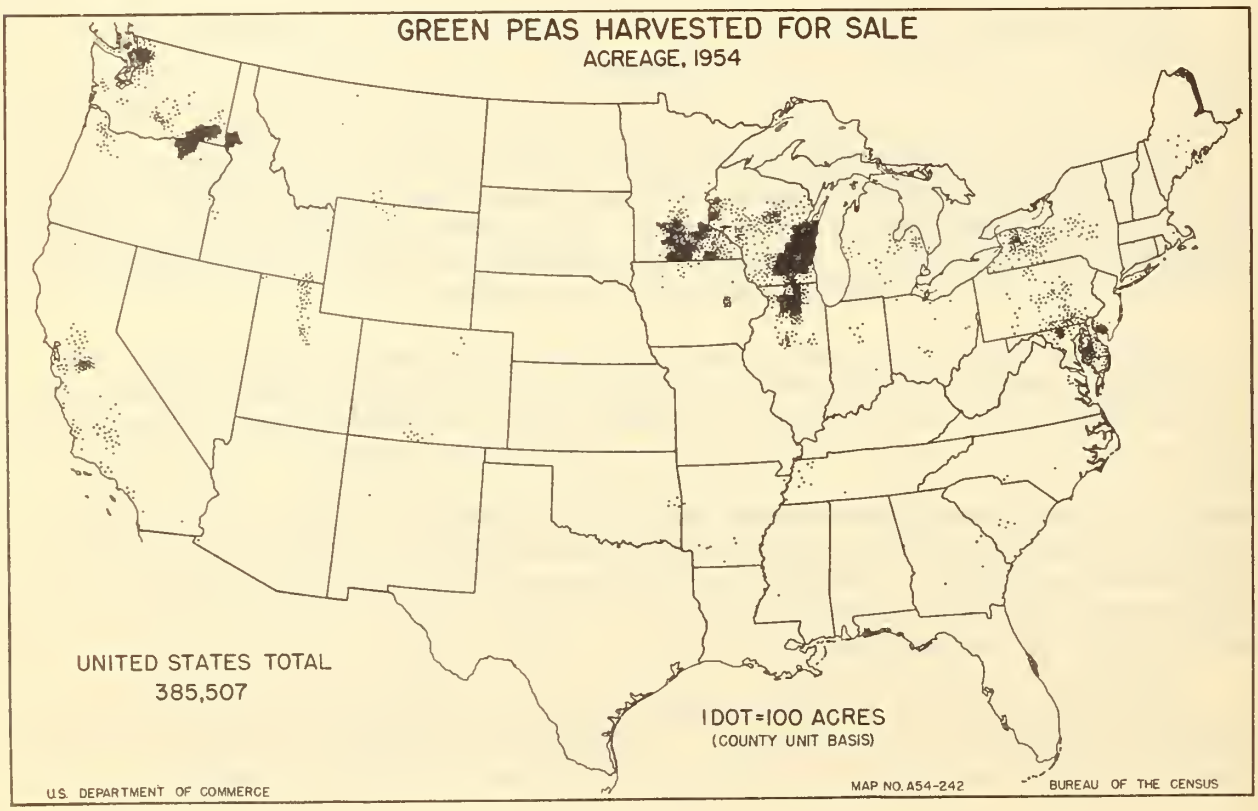


Figure 10.

combined, and only 7 percent in the Midwest. The same year, 62 percent of the canned peas were processed in the Midwest, 25 percent in the West, and 10 percent in the Northeast.

Cabbage

Of 15 vegetables studied which are processed in some form, only cabbage showed a decline in consumption in all forms. Between the 2 periods, total consumption per person declined 26 percent. Fresh cabbage consumption went down 29 percent and sauerkraut consumption declined 9 percent. Fresh cabbage was the only major salad vegetable to decline markedly in consumption. Apparently, it was replaced in the diet by other salad items such as lettuce, and probably also by some of the cooked dinnerplate vegetables. Sauerkraut also was probably replaced to some extent by other dinnerplate vegetables.

To some extent, the Northeast and Midwest have shifted from production of cabbage for fresh market to production for processing. In the Northeast, production for fresh market declined 22 percent from 1939-41 to 1953-55, while production for sauerkraut increased 4 percent. In the Midwest, fresh-market output declined 19 percent and processing production increased 15 percent (table 7).

Table 7.--Shifts in production areas for cabbage, fresh market and processing, 1939-41 to 1953-55

Item	Fresh market			Processing		
	1939-41	1953-55	Change	1939-41	1953-55	Change
	Percent	Percent	Percent	Percent	Percent	Percent
Principal States in:						
Mid-Atlantic 1/	27	22	-22	41	40	+4
Midwest	17	15	-19	37	39	+15
South	35	44	+19	0	0	--
West	13	15	+12	0	0	--
Other States	8	4	-50	22	21	+6
United States	100	100	-5	100	100	+8

1/ In this region, New York was the only State that produced cabbage for processing.

Production of cabbage for fresh market has shifted to the South and West. In the South, production rose 19 percent between the 2 periods. California output went up 39 percent. In the postwar period, these 2 sections together accounted for 11 percent more of the national output than in the prewar years.

Sauerkraut canning is concentrated in New York, Pennsylvania, and Wisconsin. In 1952-53, these three States accounted for two-thirds of the national pack, with 37 percent of the national output in New York and Pennsylvania combined, and 30 percent in Wisconsin. Ohio, Michigan, and Indiana together accounted for an additional 16 percent.

Snap Beans

Per capita consumption of both canned and frozen snap beans increased; that of the fresh form declined, although total consumption of all forms increased (fig. 11). A part of the increase in consumption of processed forms appears to represent a shift from other dinnerplate vegetables.

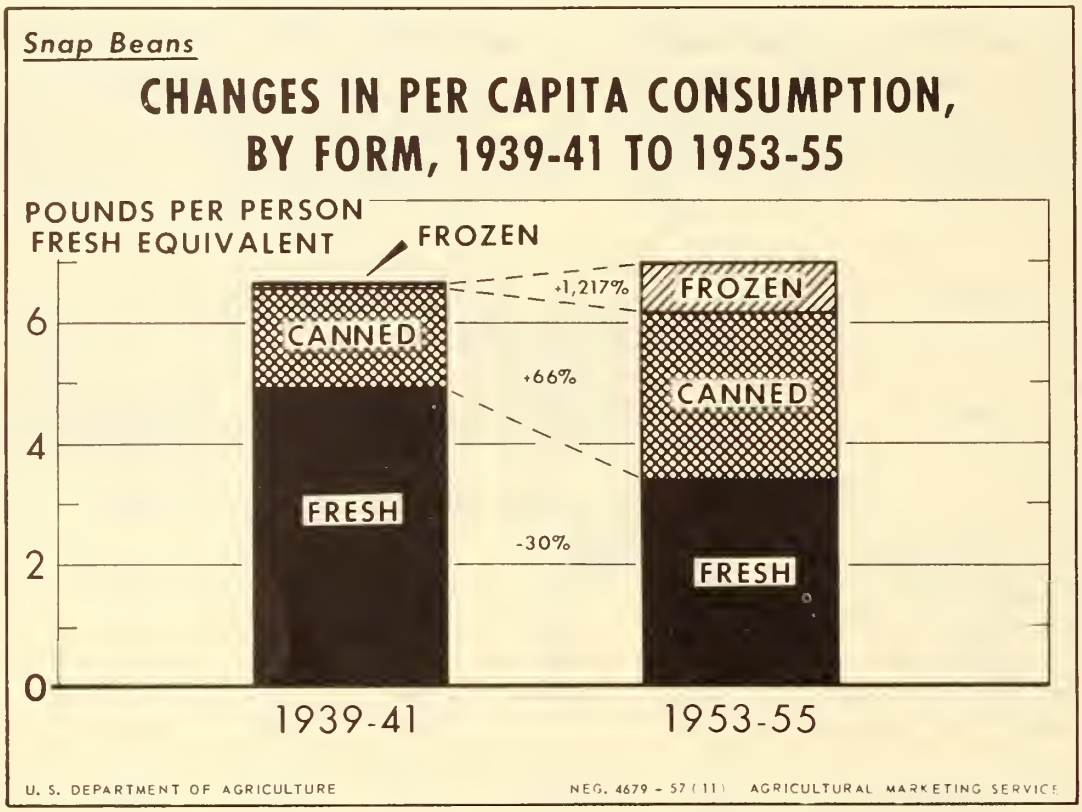


Figure 11.

There has been relatively little change in the production pattern of snap beans for fresh-market since the prewar period. The South increased its share of fresh-market production at the expense of the low-production States (table 8). The greatest change took place in production for the processing market. Northeastern production increased 290 percent, most of it for canning. In the West production rose 274 percent, with a portion of the increase going

to the freezers as well as the canners. Production for processing in the South rose 121 percent. Over 60 percent of the 1953 pack of frozen snap beans and 20 percent of the canned green beans were put up in the South.

Table 8.--Changes in production areas for snap beans, fresh market and processing, 1939-41 to 1953-55

Item	Fresh market			Processing		
	1939-41	1953-55	Change	1939-41	1953-55	Change
	Percent	Percent	Percent	Percent	Percent	Percent
Principal States in:						
Northeast	15	15	-12	15	22	+290
Midwest	2	2	+1	18	11	+65
South	54	63	0	36	29	+121
West	10	12	-8	25	34	+274
Total	81	92	-3	94	96	+178
Other States	19	8	-64	6	4	+80
United States	100	100	-15	100	100	+172

For snap beans, as for almost every other vegetable, the specialist States increased their share of production, both for fresh market and for processing.

Onions

Consumption rates for onions have declined 11 percent since 1939-41, and there have been some substantial shifts between production areas. National production increased 32 percent between 1939-41 and 1953-55. Production in the Midwest rose only 4 percent, while total production in 3 Northeastern States rose 11 percent. There were shifts within these areas as well (table 9). Production in Massachusetts and Indiana declined by over one-half, while that in Michigan, New Jersey, New York, and Wisconsin increased by 20 percent or more.

Onion production increased sharply in California, Oregon, and Washington, and more modestly in Texas. In the West Coast States, production more than doubled over the period, giving the West 40 percent of the national onion production in 1953-55, as compared with 32 percent in 1939-41.

Table 9.--Shifts in production areas for onions, 1939-41 to 1953-55

Item	1939-41	1953-55	Change
	Percent	Percent	Percent
Principal States in:			
Northeast	26	22	+13
Midwest	25	20	+4
South	12	14	+52
West	32	40	+65
Total	95	96	+33
Other States	5	4	+10
United States	100	100	+32

Carrots

Consumption of processed carrots has increased; that of fresh carrots has held steady. However, consumption of processed carrots makes up a small portion of the total--only 11 percent in 1953-55. Much of the processed commodity is sold as a mixture of peas and carrots; approximately 40 percent of the canned and 30 percent of the frozen pack of carrots in 1953 was in this form, according to data compiled by the National Canners Association and the National Association of Frozen Food Packers.

Carrot production has shifted to the West, chiefly to California. Over half of the national production now comes from the West, with 42 percent from California alone (table 10). Principal States in the Midwest and South have about maintained their share of national production, while the Northeastern States have lost out to the specialist States. California production is concentrated in the Imperial Valley in the winter and spring, and in the Salinas-Watsonville area from late spring through fall.

Celery

Celery consumption rose slightly from 1939-41 to 1953-55. Apparently, there was some shift from celery to other salad vegetables such as lettuce and tomatoes over this period.

There has been a pronounced shift in celery production to Florida and California since 1939-41 (table 11). These 2 States provided 45 percent of the national production in 1939-41, and 81 percent in 1953-55. The shipping

season from both of these States lasts much longer than in earlier years. These areas have captured a portion of the market from production areas near the markets, even during the peak production season. For instance, shipments from California to Boston fell off to very low volumes during the summers in 1939-41, ceasing entirely during each August. In 1953, California was an important supplier throughout the summer months, supplying 15 percent of the total supplies in August, which was the low point for the year.

Table 10.--Shifts in production areas for carrots, 1939-41 to 1953-55

Item	1939-41	1953-55	Change
	Percent	Percent	Percent
Principal States in:			
Northeast	16	10	-3
Midwest	14	7	-27
South	12	18	+107
West	46	56	+71
Total	88	93	+47
Other States	12	7	-20
United States	100	100	+39

Table 11.--Shifts in production areas for celery, 1939-41 to 1953-55

Item	1939-41	1953-55	Change
	Percent	Percent	Percent
Principal States in:			
Northeast	12	7	-31
Midwest	20	7	-51
Florida	21	28	+77
West	41	56	+85
Total	94	98	+39
Other States	6	2	-46
United States	100	100	+34

Spinach and Kale

Consumption of spinach and kale combined has declined 17 percent since 1939-41, with spinach consumption going down 19 percent and kale consumption rising 4 percent. There has been a shift from fresh to frozen forms of both spinach and kale (table 12). Three-fourths of the spinach and almost all of the kale was consumed fresh in 1939-41, with almost all the rest of the spinach being canned. Since that time, there has been a marked shift to processed spinach and kale. Purchases of processed spinach were divided about equally between canned and frozen. Frozen kale made up 18 percent of the total consumption.

Table 12.--Per capita consumption of spinach and kale, 1939-41 to 1953-55

Item	Total	Fresh	Canned	Frozen
	Percent	Percent	Percent	Percent
	Percentage of change, 1939-41 to 1953-55			
Kale	+4	-15	--	+∞
Spinach	-19	-57	-7	+2,233
	Percentage of total consumption, 1939-41			
Kale	100	100	0	0
Spinach	100	75	24	1
	Percentage of total consumption, 1953-55			
Kale	100	82	0	18
Spinach	100	40	27	33

Production of spinach for fresh market has shifted from the low-production States to the South. Production declined in all areas except the South (table 13).

Production of spinach for processing rose sharply during this period. California accounted for nearly half of the production in both periods, with output nearly doubling. A large part of this went into the frozen product. Production in the South--chiefly for canning--has increased somewhat, but at a slower rate than in other sections, so that the South's share of the national output fell from 27 to 19 percent.

Table 13.--Changes in supply areas for spinach for fresh market and for processing, 1939-41 to 1953-55

Item	Fresh market			Processing		
	1939-41	1953-55	Change	1939-41	1953-55	Change
	Percent	Percent	Percent	Percent	Percent	Percent
Principal States in:						
Mid-Atlantic 1/	22	22	-47	0	0	--
Midwest	4	3	-66	0	0	--
South	14	32	+19	27	19	+30
West 2/	14	17	-38	46	48	+88
Other States	46	26	-70	27	32	+111
United States	100	100	-48	100	100	+79

1/ In this region, New Jersey is the only State that produced spinach for processing.

2/ In this region, California is the only State that produced spinach for processing.

Kale production is reported individually only for Virginia, which produced 51 percent of the crop in 1939-41 and 53 percent in 1953-55. All of the frozen kale is packed in the South.

Broccoli, Brussels Sprouts, and Cauliflower

These three vegetables are available in fresh and frozen form. Fresh cauliflower has been a standard vegetable for many years. Broccoli and brussels sprouts have become more popular since they became available in frozen form. Consumption of all forms of broccoli and brussels sprouts has increased 72 and 14 percent, respectively, since 1939-41, while per capita consumption of cauliflower declined 10 percent over the same period. Consumption of cauliflower is still the most important component of this group. In 1953-55, it comprised 65 percent of the group total, with broccoli 28 percent, and brussels sprouts only 7 percent.

With the introduction of the frozen commodity, there was a major shift from the fresh to the frozen form of each of these vegetables (table 14). More than half of the brussels sprouts and broccoli is consumed in frozen form. Most cauliflower is still sold fresh. It is generally available in Northeastern markets from Long Island through mid-December, and from California through the winter and most of the spring months.

There have been no important shifts in production areas for these three commodities. California and New York are the only States producing brussels

Table 14.--Per capita consumption of broccoli, brussels sprouts, and cauliflower, 1939-41 and 1953-55

Item	1939-41			1953-55			Change, 1939-41 to 1953-55		
	Both forms	Fresh	Frozen	Both forms	Fresh	Frozen	Both forms	Fresh	Frozen
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Broccoli	100	97	3	100	48	52	+72	-14	+3,100
Brussels sprouts	100	96	4	100	31	69	+14	-13	+2,100
Cauliflower	100	99	1	100	80	20	-10	-27	+2,750
Total	100	99	1	100	68	32	+6	-28	+2,760

sprouts in significant commercial quantities, with 80 percent of total national production coming from California in 1953-55. All of the brussels sprouts frozen in 1953 came from California.

Nearly half of the broccoli produced in recent years came from California, with 13 percent from the mid-Atlantic States and 12 percent from Texas. Three-fourths of the frozen broccoli was packed in California.

About 40 percent of the cauliflower produced in 1953-55 came from California, and nearly 30 percent from New York and New Jersey, mostly Long Island. Other Western States produced an additional 14 percent of the national output, with declines in production in Colorado and Washington being more than offset by increases in Arizona and Oregon. Nearly three-fourths of the frozen cauliflower is put up in the West, chiefly in California; most of the remainder is packed in the North Atlantic area.

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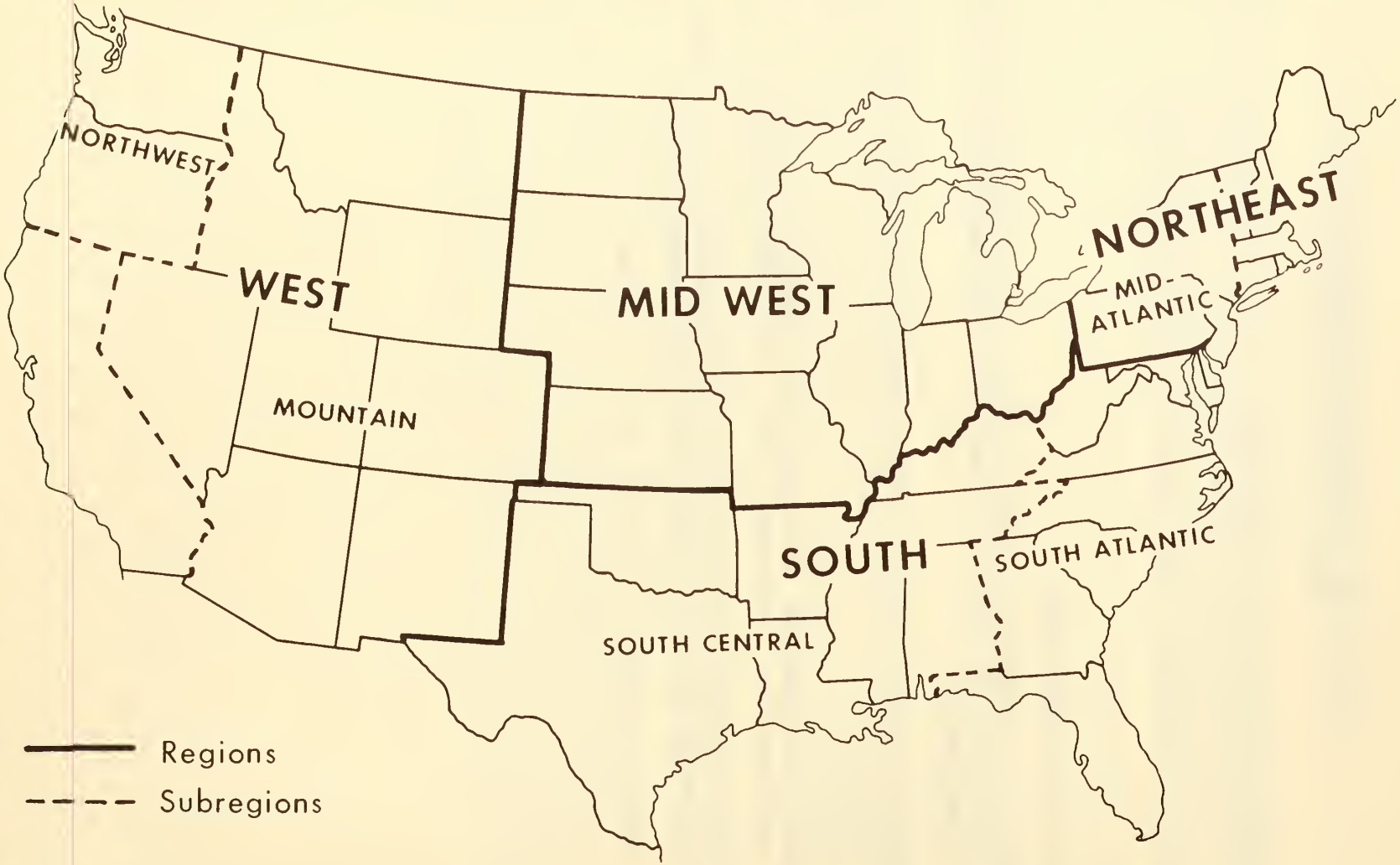
REGIONS AND SUBREGIONS USED IN THIS STUDY



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